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FOR

MICROWAVE COOKING CONTAINER WITH VENTING ASSEMBLY

BY

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CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit of U.S. Provisional Application No. 60/498,021, filed August 27, 2003 and PCT/US04/14906 filed on May 12, 2004 both of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

The present invention relates to the field of cooking devices, and, more particularly, to cooking containers for use in a microwave oven for cooking meats, vegetables, and other food products.

Consumers often prefer to cook food in a microwave oven rather than conventional ovens because of the reduced cooking time required to heat foods in a microwave oven. Consumers also want to be provided with the opportunity to cook pre-packaged food products in the package in which they were purchased without the hassle of transferring the food from one container to the next.

Unfortunately, foods cooked in a microwave oven tend to be tough and/or dry in texture and consistency, rather than tender and moist. When liquid is added to the food in an attempt to retain moisture, the food can become soggy and undesirable. In addition, microwave ovens do not evenly distribute heat to the product being cooked. This results in a cooked food product that may be very hot in one area, but cold in another area. Because of these problems, many people consider microwave cooking to be problematic and generally undesirable.

One method for improving the texture and consistency of food cooked in a microwave oven is to use steam generated by the heated food product to assist in cooking the food. Cooking with steam not only provides moisture for the food being cooked, but also results in more consistent heating

throughout the food product.

Specifically, a container using the steam generated by the heated food product to assist in cooking the food takes advantage of the ideal gas law, a distillation of several kinetic theories including Boyle's Law and Gay-Lussac's Law. More specifically, such containers take advantage of the proportional relationship between pressure and temperature when volume and number of gas molecules remain constant. This proportional relationship can be expressed as a mathematical equation, $(P2/P1) = (T2/T,)$, where P1 is the initial pressure, P2 is the final pressure, T1 is the initial temperature, and T2 is the final temperature. Accordingly, any increase in pressure will result in a proportional increase in temperature that would not occur at ambient pressures. For example, if the pressure was to increases 1.2 fold (e.g., from 1 to 1.2 atmospheres), the temperature would also increase 1.2 fold (e.g., from 275 K to 330 K, which is an increase from 35°F to 134°F).

In order to steam cook a food product in a microwave oven, the steam must be retained within a cooking container; accordingly, the container must be at least partially sealed. When a sealed container is used to heat a food product contained therein, pressure rapidly builds as steam is generated from the heated food product. As heating continues, this pressure will continue to escalate until the container ruptures in some fashion, thereby relieving the pressure.

This relief often comes in the form of an explosion forcing an opening of the container and resulting in food being ejected therefrom. Not only does such an explosion create a mess, but it also undermines the attempt to use steam to cook the food product because the explosion causes a rapid release of the collected steam from the no longer sealed cooking environment.

The release of pressure can be controlled, for example, by providing vents along an edge of the base of the container, which is thereafter married to a covering. These vents create a weakened portion in the seal between the container's covering and its base. When the sealed

cooking environment attains a pressure creating a risk of explosion, the weakened portions in the seal allow for a controlled pressure release at the vents. The seal between the container's covering and its base is broken at the point where the pressure release occurs, creating a tab which may be grasped or otherwise used to pull the covering from the base, breaking the remainder of the seal such that consumption of the food product may occur. An example of such a venting configuration is described in commonly assigned U.S. Patent No. 6,559,431, which is incorporated in its entirety herein by reference.

Although this type of venting configuration is effective for steam cooking a food product in a microwave oven, it specifically requires vents to be molded along the edge of the base of the container being used. Additionally, this type of venting configuration can not be used in containers which lack a substantially rigid base, for example, cooking bags cannot be provided with this type of venting configuration.

It is therefore the paramount object of the present invention to provide a microwave cooking container with a venting assembly, wherein the container may be any microwave 20 cooking container having a sealed cooking environment.

This and other objects and advantages of the present invention will become apparent upon a reading of the following description.

DESCRIPTION-OF THE DRAWINGS

Figure 1 is a perspective view of a microwave cooking container with a venting assembly made in accordance with the present invention.

Figure 2 is an exploded perspective view of the venting assembly of Figure 1, including a venting disk and a patch.

Figure 2a is an enlarged perspective view of a portion the venting disk of Figure 2.

Figure 3a is a plan view of the venting disk of Figure 2.

Figure 3b is a cross sectional view of the venting disk taken along line A-A of Figure 3a.

Figure 3c is a cross sectional view of the venting disk taken along line B-B of Figure 3a.

Figure 3d is a perspective view of the venting disks of Figure 2.

Figure 4 is a perspective view of the assembled venting assembly of Figure 1.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is a microwave cooking container 10 with a venting assembly 12, wherein the container may be any microwave cooking container having a sealed cooking environment. With reference to Figure 1, the container 10 includes at least one compartment 22 for retaining food product, at least one opening 19 for receiving food product, and at least one venting assembly 12. The container is composed of a material, such as polypropylene, that is transparent to radiant energy, such as energy from a microwave oven.

Although it is not necessary for practicing the present invention, the exemplary embodiment of the container 10 shown in the Figures includes an insert 38 having a floor 40 with a pattern. It has been found that certain patterns provide better steam cooking environments for certain types of foods. For example, a flat floor is good for foods with a high sugar content, such as desserts. -For another example, as shown in Figure 1, a floor comprising a plurality of pyramid-shaped projections 42 raised therefrom provides a good cooking environment for foods with heavy sauces. Of course, many other raised floor patterns can be contemplated. Additionally, the insert 38 may include one or more side walls 44, which upwardly extending from the floor 40 and terminating at an upper edge 46. The floor insert 38 may also be sealed to the container 10 along the upper edge 46 to keep food product from becoming lodged between the inner wall of the container 10 and the side walls 44 of the floor insert 38 or beneath the insert 38.

Because the container 10 is being used to steam cook a food product, the steam must be retained within a container 10 while the food product is being prepared; accordingly, the container 10 must have a sealed cooking environment. A sealed cooking environment is one which has a

substantially fixed volume. Specifically, after food product has been delivered to the compartment 22, the opening 19 is sealed, thereby substantially fixing the volume of the container 10. The manner in which the opening 19 is sealed depends on the type of container 10 being used. For example, as shown in Figure 1, the container 10 could be a cooking bag having an opening 19 at the top end, in which case the opening 19 could be sealed using a heat seal or food grade adhesive. For another example, which is not shown, the container could be a cooking tray having a base with at least one compartment for holding food product and a covering, such as a snap-on lid or a flexible film, for sealing the opening to the compartment. Again, it is contemplated that any container having a sealed cooking environment could be used without departing from the spirit and scope of the present invention.

The venting assembly 12 of the present invention is designed to maintain the fixed volume of the container 10 until the pressure from the steam generated during heating increases to a point that it causes the venting assembly 12 to allow steam to exit the container 10 through at least one aperture 18 defined through a surface 36 of the container 10. With reference to Figure 2, the preferred venting assembly 12 includes a venting disk 14, which covers the apertures 18, and a patch 16, for securing the venting assembly 12 to the surface 36 of the container 10.

The venting disk 14 may be composed of, for example, polypropylene, and may be constructed using a variety of methods, for example, by thermoforming or die cut trimming. The venting disk 14 includes a base 26 and a steam pocket 20, which defines a volume. As shown in Figure 2a, the pocket 20 is connected to the base 26 along only a portion of its periphery, such that a slot 28 remains between a separated portion 30 of the pocket 20 and the base 26.

Referring now to Figures 3a-3d, in the illustrated embodiment, the pocket 20 includes a roof 24 and a side wall 22, which extends downwardly from the roof 24 and connects the roof 24 to the base 26. Of course, the steam pocket 20 of the present invention could be comprised of an alternative

structural element, for example, a single dome-shaped wall. Also, the pocket 20 could take on any shape or size.

In any event, as shown in Figures 3a-3d, although the side wall 22 of the steam pocket 20 may be considered a single structural element, the side wall 22, as shown in Figures 3a-3d, can be described with reference to a plurality of discrete portions indicated by the reference numerals 22a, 22b, 22c, 22d, 22e, 22f and 22g.

The steam pocket 20 comprises at least one steam guide 62 and an associated pair of steam horns 72, 73. The steam guide 62 has a volume defined by a substantially V-shaped portion of the roof 24 and two wedge-shaped portions of the side wall 22d, 22e. The tips of the "wedges" and the "V" unite adjacent the base 26 of the disk 14. Similarly, the steam horns 72, 73, which are positioned on either side of the steam guide 62, each have a volume defined by a horn-shaped portion of the roof 24 and two wedge-shaped portions of the side wall 22b, 22c, 22f, 22g. The tips of the "wedges" and the "horns" unite adjacent the base 26 of the disk 14.

Referring now to Figure 2a, as mentioned above, the pocket 20 is connected to the base 26 along only a portion of its periphery, such that a slot 28 remains between the separated portion 30 of the pocket 20 and the base 26. In the illustrated embodiment, the pocket 20 is connected to the base 26 at the interface between the base 26 and the substantially semicircular portion of the sidewall indicated by the reference numeral 22a.

Turning now to the patch 16 of the venting assembly 10, the patch 16 may be composed of, for example, polypropylene, and may be constructed using a variety of methods, for example, by thermoforming or by die cut trimming. The patch 16 has an upper side 32, a lower side (not shown), and an inner edge 36 defining an opening 34 for receiving the pocket 20 of the venting disk 14. Specifically, as best illustrated by Figures 2, 2a, and 4, the inner edge 36 is fed into the slot 28 such that the separated portion 30 of the pocket 20 rests on the upper side 32 of the patch 16, while the remaining portion of the pocket 20 extends through the opening 34 and the lower side 32 of the patch 16

abuts the base 14 of the venting disk 14.

As best shown in Figures 3b and 3c, in the illustrated embodiment of the invention, the base 26 of the disk 14 is preferably somewhat concave. This concave shape pushes the patch 16 up against the separated portion 30 of the pocket 20. Alternatively, the separated portion 30 of the pocket 20 and the patch 16 may be held together, for example, by using a food-grade adhesive.

The associated disk 14 and patch 16, collectively referred to as the venting assembly 12, are positioned over the apertures 18 in the surface 36 of the container 10 such that the volume of the the pocket 20 is placed in fluid communication with the interior of the container 10 via the apertures 18. The patch 16 is then secured to the surface 26 of the container 10, thereby securing the venting assembly 12 to the container 10. In this regard, the patch 16 covers a wider surface area than the disk 14 and, as such, extends beyond the base 26 of the disk 14 such that its lower side (not shown) abuts the surface 26 of the container 10 and is secured thereto using, for example, a heat seal or a food-grade adhesive. By securing the assembly 12 to the surface 36 and sealing the opening 19 of the container 10, a substantially fixed volume is created within the container 10.

As mentioned above, when the food product in the container 10 is prepared for consumption, the moisture from the food product creates steam as it approaches its boiling point. The steam generated causes the pressure within the container 10 to increase. As the pressure continues to build, the steam travels through the aperture 18 into the pocket 20. The steam and pressure within the pocket 20 eventually increases to a magnitude sufficient to lift the separated portion 30 of the pocket 20 away from the patch, thereby allowing venting of the container 10 to occur through the apertures 18. In the illustrated embodiment of the present invention, the guide 62 and the steam horns 72, 73 direct the steam and pressure to their tips. Thus, the pressure is heavily concentrated at the separated portion 30 of the pocket 20 thereby allowing venting of the container 10 to occur more effectively.

Although it is not illustrated in the accompanying figures, it is contemplated that the venting assembly could be used without the patch. In such an embodiment of the present invention, an aperture is defined through the surface of the container, which is capable of receiving the pocket of the venting disk. Specifically, the separated portion of the pocket is fed through the aperture and a portion of the surface of the container is retained within the slot such that the separated-portion of the pocket rests on an outer side of the surface of the container, while the remaining portion of the pocket extends through the aperture and the base of the venting disk abuts an inner side of the surface of the container. The disk is preferably somewhat concave such that it pushes the surface of the container up against the separated portion of the pocket. Alternatively, the separated portion of the pocket and the outer side of the surface of the container may be held together, for example, by using a food-grade adhesive.

It will be obvious to those skilled in the art that other modifications may be made to the invention described herein without departing from the spirit and scope of the present invention.